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# Effectiveness of Platelet-rich Plasma Injection as an Adjunct Treatment to Arthroscopy for TFCC Injury: A Retrospective Cohort Study

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**Background:** Triangular fibrocartilage complex (TFCC) injuries can cause significant patient dysfunction. Platelet-rich plasma (PRP) has emerged as a potential adjunctive treatment for arthroscopic TFCC repair, with some studies suggesting improved outcomes. This study aims to evaluate and compare PRP as an adjunctive treatment in arthroscopic TFCC tear repair.

**Methods:** This retrospective cohort study examined patients undergoing arthroscopic TFCC repair at Institut de la Main, Paris, France (December 2021–2022). Patients were split into two groups: arthroscopic repair alone (1) and repair with PRP injections (2). Physical examinations were conducted pre- and posttreatment, recording flexion, extension, and radial/ulnar deviation of the affected and contralateral wrists.

**Results:** A total of 33 patients (20 men and 13 women) with a mean age of 30.55 ± 9.17 years were included. PRP injections were given to 16 patients with arthroscopic TFCC repair; 17 had repair only. No significant differences existed preoperatively between groups in wrist function or pain ($P > 0.05$). The Quick Disabilities of the Arm, Shoulder, and Hand (DASH) score differed significantly ($P = 0.004$). The non-PRP group demonstrated better postoperative upper extremity function, with a mean Quick DASH score of 7.75 ± 5.91 compared with 12.64 ± 6.79 in the PRP group. No significant difference between groups was observed in the pain visual analog scale ($P > 0.05$).

**Conclusions:** PRP injections with TFCC repair did not improve function over repair alone. The non-PRP group showed better function (lower Quick DASH scores). Pain reduction was similar between groups. Larger trials and cost-effectiveness studies are needed to fully assess PRP's benefits in TFCC repair. *(Plast Reconstr Surg Glob Open 2024; 12:e6237; doi: 10.1097/GOX.0000000000006237; Published online 10 October 2024.)*

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## INTRODUCTION

The triangular fibrocartilage complex (TFCC) is situated on the ulnar aspect of the wrist between the lunate, triquetrum, and ulnar head. It acts as a weight-bearing structure that stabilizes the distal radioulnar joint and serves as a shock absorber for the ulnocarpal joint. TFCC injuries can be classified based on etiology as acute or degenerative.[1]

Arthroscopy is the diagnostic gold standard for TFCC injuries and has gained significant popularity in recent years as a primary treatment modality for peripheral TFCC injury.[1,2] This minimally invasive surgical technique offers advantages such as reduced morbidity and faster recovery time.[2] However, complications and incomplete healing can occur, highlighting the need for novel biological solutions such as platelet-rich plasma (PRP)

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to augment healing and promote tissue regeneration. Recent studies have suggested that PRP injection could be added to TFCC repair, including foveal tears, due to its potential to accelerate tissue healing and repair through the action of growth factors. This approach aims to enhance the healing process and potentially improve patient outcomes.[3]

PRP is a blood-derived product rich in platelets and growth factors. It has been used as an adjuvant treatment for various orthopedic conditions, such as rotator cuff repair, wrist fractures, and trapeziometacarpal arthritis, and may enhance tissue healing and regeneration by stimulating angiogenesis, collagen synthesis, cell proliferation, and differentiation.[4] PRP may also have anti-inflammatory and analgesic effects through the modulation of cytokine levels and neurotrophic growth factor expression.[5]

Despite the benefits of arthroscopic techniques, they alone may not suffice to promote complete tissue regeneration in TFCC injury due to poor blood supply.[6] PRP may be indicated under such conditions because of its potential to augment and accelerate the healing process by delivering growth factors to the site of injury.[7] For instance, a meta-analysis by Wang et al evaluated the clinical effectiveness and safety of PRP in arthroscopic repair of rotator cuff injuries, finding that autologous PRP injection is a safe and effective treatment option.[8]

Overall, PRP represents a promising therapeutic option to augment healing and promote tissue regeneration in the treatment of tendinopathy.[9] However, there is still a lack of consensus on the optimal use, frequency, and dosage of PRP in the arthroscopic treatment of TFCC injury. Furthermore, the efficacy of PRP in promoting tissue regeneration and preventing injury recurrence remains a subject of further investigation. Our study aimed to evaluate the effects of PRP as an adjunctive treatment to arthroscopy for the management of TFCC injuries compared with arthroscopic treatment alone.

## METHODS

### Study Design

This retrospective cohort study was approved by the institutional review board (IRB) of the ethical committee of the International Wrist Center (Study 2022-25, IRB approval number: A015002) and classified as low negligible risk. The study design and reporting followed the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology statement.[10]

Patient charts of all patients who underwent arthroscopic treatment of peripheral TFCC injuries at Institut de la Main, Paris, France, by a single surgeon between December 2021 and December 2022 were reviewed. The study compared the PRP group (group B) with the non-PRP group (group A) retrospectively, with efforts made to match demographics closely between the two groups. The inclusion criteria included rupture of the peripheral part of the TFCC repaired arthroscopically. The exclusion criteria were patients who underwent other associated repairs performed at the same time as the intervention or had previous wrist surgery, foveal rupture, rheumatoid arthritis, hypermobility, pregnancy, or any surgical history of the wrist.

Data on age, sex, and history of trauma were recorded. Standard wrist posteroanterior and lateral radiographs and magnetic resonance imaging were performed before surgery in all patients. All patients completed treatment at the time of data collection, and informed consent was obtained from all patients. The minimum follow-up period was 2 months.

### Takeaways

**Question:** Does platelet-rich plasma (PRP) improve outcomes in arthroscopic triangular fibrocartilage complex repair?

**Findings:** No significant improvements in functional outcomes with PRP were observed.

**Meaning:** PRP as an adjunct treatment for triangular fibrocartilage complex repair requires further research to confirm benefits.

### Surgical Technique

All cases were performed under regional anesthesia in the supine position. Arthroscopy was performed with an upper arm tourniquet inflated to 100 mm Hg above the patient's systolic blood pressure. The arthroscope was introduced through the 2,4 portal, also known as the radial midcarpal portal, located between the second and third extensor compartments, approximately 1 cm distal to the Lister tubercle. This portal provides excellent visualization of the radial aspect of the TFCC and is routinely used for arthroscopic TFCC repair.

Arthroscopic treatment encompassed several steps. Initially, debridement was performed to remove torn or degenerated tissue. Direct repair of the tear was considered based on specific criteria: the size and location of the tear, and the tissue quality. Direct repair was feasible when the tear was limited, predominantly peripheral, and involved tissue with adequate healing potential. Patients who underwent ulnar shortening osteotomy were excluded from this study, as ulnar shortening osteotomy is typically performed for central TFCC tears. This procedure aimed to alleviate stresses on the TFCC by shortening the ulnar length.

All patients underwent a standardized postoperative immobilization protocol consisting of 6 weeks of splinting with only authorized daily life activities, followed by guided rehabilitation starting after 6 weeks. Return to sports was restricted until 3 months after repair.

### PRP Injections

PRP was prepared using the Arthrex ACP Double Syringe System (Arthrex, Inc., Naples, Fla.) according to the manufacturer's protocol. Briefly, 15 mL of venous

**Table 1. Demographic and Follow-up Information for Patients Undergoing Arthroscopic Repair for TFCC Injuries**

| | Without PRP Group | PRP Group | Total |
|---|---|---|---|
| Age, y | 30.35 ± 10.34 (17–55) | 30.75 ± 8.07 (20–45) | 30.55 ± 9.17 (17–55) |
| Sex (male/female) | 11/5 (68.8%: 31.3%) | 9/8 (52.9%: 47.1%) | 20/13 (60.6%: 39.4%) |
| Follow-up | 4.06 ± 1.64 (2–7) | 3.81 ± 1.72 (2–7) | 3.94 ± 1.66 (2–7) |

blood was drawn into the double syringe containing 1.5 mL of anticoagulant citrate dextrose solution. The blood was then centrifuged at 1500 rpm for 5 minutes to separate the PRP. In group B, 3–5 mL of PRP was injected into the TFCC under ultrasound guidance immediately after arthroscopic repair, while the patient was still under anesthesia.

The Arthrex protocol for preparing PRP consists of (1) drawing 15 mL of blood with sodium citrate as an anticoagulant, (2) centrifuging at 3200 rpm for 15 minutes, (3) separating PRP from platelet-poor plasma and red blood cells using a sterile pipette, and (4) activating platelets with calcium chloride or thrombin to induce clotting and release growth factors. This process ensures a high concentration of platelets (four to six times baseline) and low white blood cell count (less than 1% of baseline) in the final PRP output.

### Outcomes

A pre- and postoperative range of motion measurements (flexion, extension, supination, pronation, radial, and ulnar deviation) were recorded. In addition, the visual analog scale (VAS) and shortened Disabilities of the Arm, Shoulder, and Hand (Quick DASH) scores of all patients were recorded at their first and final visits. Hand grip strength was measured using a Jamar dynamometer.

The Quick DASH score is a patient-reported outcome measure that assesses pain and other subjective difficulties with sedentary-level activities of daily living. It consists of 11 items that evaluate the patient's ability to perform various daily tasks and the severity of pain and other symptoms.

### Statistical Analysis

Data were presented as means, SDs, medians, and ranges for quantitative variables, and as frequencies (counts) and relative frequencies (percentages) for categorical variables. The Shapiro-Wilk test was used to test for the normal distribution of continuous variables. Comparisons between quantitative variables were performed using the nonparametric Mann-Whitney U test. The nonparametric Wilcoxon signed-rank test was used to compare pre- and postoperative measurements in each patient. The Wilcoxon rank-sum test was used to compare the continuous variables before surgery and at follow-up. Statistical analyses were performed using IBM SPSS Statistics, version 26 (IBM Corp., Armonk, N.Y.). Statistical significance was set at $P$ value of less than 0.05 was considered statistically significant. Graphs were created using GraphPad Prism 8 software (GraphPad Software, San Diego, Calif.).

## RESULTS

### Participant Demographics and Baseline Characteristics

The study included 33 patients, with 17 in group A (did not receive PRP) and 16 in group B (received PRP), comprising 20 men and 13 women. The average age of participants was 30.55 ± 9.17 years. The mean postoperative follow-up period was approximately 3.94 ± 1.66 months, with a range spanning from 2 to 7 months. The preoperative evaluation showed no significant differences in wrist motion, VAS, or DASH scores between the two groups (PRP and non-PRP), indicating a comparable baseline level of wrist function and symptoms. Table 1 presents the basic demographics and characteristics of the patients included in the study.

### Preoperative versus Postoperative Outcomes

Preoperative Quick DASH scores were higher in the non-PRP group (40.78 ± 17.58) compared with the PRP group (28.13 ± 15.28). Postoperatively, the non-PRP group had better Quick DASH scores (7.75 ± 5.91) than the PRP group (12.64 ± 6.79). Pain scores did not differ significantly between the groups postoperatively ($P = 0.739$). Postoperatively, patients in group A (without PRP) demonstrated significant improvements in flexion, pronation, and ulnar deviation, with $P$ values of 0.018, 0.008, and 0.001, respectively.

The mean preoperative VAS score was 3.69 ± 1.14 in the PRP group (group B) and 3.88 ± 1.11 in the non-PRP group (group A) ($P = 0.739$). Postoperatively, the mean VAS score improved to 0.38 ± 0.62 in the PRP group and 0.71 ± 0.69 in the non-PRP group ($P = 0.739$). Additionally, there were marked reductions in pain VAS, improvements in Quick DASH scores, and increases in grip strength in both groups, indicating decreased pain and improved function. In group A (non-PRP), pain VAS decreased from 3.88 ± 1.11 to 0.71 ± 0.69 ($P < 0.001$), Quick DASH scores improved from 40.78 ± 17.58 to 7.75 ± 5.91 ($P < 0.001$), and grip strength increased from 21.18 ± 6.12 to 30.06 ± 6.69 ($P < 0.001$). In group B (PRP), pain VAS reduced from 3.69 ± 1.14 to 0.38 ± 0.62 ($P < 0.001$), Quick DASH scores improved from 28.13 ± 15.28 to 12.64 ± 6.79 ($P = 0.002$), and grip strength increased from 24.0 ± 6.09 to 31.31 ± 7.93 ($P = 0.001$). The difference in posttreatment outcomes between the two groups was not statistically significant for pain VAS ($P = 0.739$) and grip strength ($P = 0.219$) but was significant for Quick DASH scores ($P < 0.004$).

In group B (PRP group), postoperative results mirrored those in group A, with significant improvements in flexion ($P = 0.010$), supination ($P = 0.001$), and ulnar deviation ($P < 0.001$). Extension slightly worsened in the PRP group (from 82.50 ± 8.56 to 80.31 ± 6.94) and improved in the non-PRP group (from 76.47 ± 6.06 to

**Table 2. Comparative Analysis of Wrist Motion Parameters in the without PRP Group and PRP Group before and after Treatment, and against the Normal Hand**

| | Without PRP Group | | | | | PRP Group | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *P* | | | | | *P* | | |
| | Normal Hand | Pre | Post | Pre vs Post | Post vs Normal | Normal Hand | Pre | Post | Pre vs Post | Post vs Normal | Difference |
| Extension | 81.18 ± 4.85 | 76.47 ± 6.06 | 79.41 ± 6.09 | 0.066 | 0.217 | 82.81 ± 7.52 | 82.50 ± 8.56 | 80.31 ± 6.94 | 0.138 | 0.375 | 0.019 |
| Flexion | 73.24 ± 4.31 | 65.29 ± 69.12 | 69.12 ± 4.76 | 0.018 | 0.017 | 74.06 ± 6.12 | 65.00 ± 10.33 | 71.56 ± 5.69 | 0.010 | 0.229 | 0.179 |
| Radial deviation | 23.24 ± 3.51 | 20.0 ± 4.33 (15-30) | 20.29 ± 4.50 (15-30) | 0.564 | 0.022 | 20.94 ± 2.02 | 18.13 ± 3.10 | 19.69 ± 2.87 | 0.132 | 0.171 | 0.261 |
| Ulnar deviation | 37.06 ± 3.98 | 25.0 ± 4.68 | 32.35 ± 2.57 | 0.001 | 0.001 | 35.63 ± 4.03 | 25.31 ± 4.99 | 32.19 ± 3.64 | <0.001 | 0.026 | 0.718 |
| Pronation | 84.12 ± 6.18 (70-90) | 77.06 ± 8.49 (60-90) | 82.94 ± 5.88 (70-90) | 0.008 | 0.533 | 83.75 ± 5.0 | 79.38 ± 7.72 | 81.25 ± 7.19 | 0.405 | 0.327 | 0.165 |
| Supination | 79.41 ± 6.59 | 62.94 ± 8.49 | 72.35 ± 4.37 | 0.001 | 0.002 | 81.88 ± 5.44 | 61.88 ± 8.34 | 75.00 ± 5.16 | 0.001 | 0.002 | 0.075 |

**Table 3. The Outcomes of the Pain VAS, Quick DASH Scores, and Grip Strength Measurements for Patients Who Did Not Receive PRP Treatment versus Those Who Did, with Assessments Made Pretreatment, Posttreatment, and against the Normal Hand**

| | Without PRP | | | | | PRP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *P* | | | | | *P* | | |
| | Normal Hand | Pre | Post | Pre vs Post | Post vs Normal | Normal Hand | Pre | Post | Pre vs Post | Post vs Normal | Difference |
| Pain VAS | 0.06 ± 0.24 | 3.88 ± 1.11 | 0.71 ± .069 | <0.001 | 0.001 | 0.06 ± 0.25 | 3.69 ± 1.14 | 0.38 ± 0.62 | <0.001 | 0.071 | 0.739 |
| Quick DASH | 0.94 ± 3.86 | 40.78 ± 17.58 | 7.75 ± 5.91 | <0.001 | <0.001 | 0.43 ± 1.71 | 28.13 ± 15.28 | 12.64 ± 6.79 | 0.002 | <0.001 | <0.004 |
| Grip strength | 31.12 ± 7.93 | 21.18 ± 6.12 | 30.06 ± 6.69 | <0.001 | 0.743 | 35.69 ± 9.26 | 24.0 ± 6.09 | 31.31 ± 7.93 | 0.001 | 0.250 | 0.219 |

79.41 ± 6.09), although these changes were not statistically significant ($P = 0.138$ and $P = 0.066$, respectively). Other findings in Table 2 did not show significant differences between the groups for most wrist motion parameters. The PRP group also exhibited significant reductions in pain VAS ($P < 0.001$), grip strength ($P = 0.001$), and improvements in Quick DASH scores ($P = 0.002$) (Tables 2, 3).

### Postoperative Outcomes: Comparison to Contralateral Unaffected Hand

In group A (non-PRP), postoperative comparisons to the contralateral unaffected hand showed significant improvements. Flexion increased to 69.12 ± 4.76 ($P = 0.017$) from the normal hand's measurement of 73.24 ± 4.31. Ulnar deviation improved to 32.35 ± 2.57 ($P = 0.001$) compared with 37.06 ± 3.98 in the unaffected hand. Supination improved to 72.35 ± 4.37 ($P = 0.002$) compared with 79.41 ± 6.59. Postoperative flexion in group A reached 94.3% of the contralateral hand ($P = 0.017$). In group B (PRP), similar improvements were observed. Flexion increased to 71.56 ± 5.69 ($P = 0.229$) from the normal hand's measurement of 74.06 ± 6.12. Ulnar deviation improved to 32.19 ± 3.64 ($P = 0.026$) compared with 35.63 ± 4.03 in the unaffected hand. Supination improved to 75.00 ± 5.16 ($P = 0.002$) compared with 81.88 ± 5.44. Postoperative flexion in group B reached 96.6% of the contralateral hand ($P = 0.229$).

## DISCUSSION

In this retrospective cohort study, we compared the outcomes of patients who received PRP injections as an adjunct to arthroscopic repair of peripheral TFCC tears with those who underwent arthroscopic repair alone. Our results showed that both groups demonstrated significant improvements in wrist motion parameters and pain scores postoperatively. However, there were no significant differences between the PRP and non-PRP groups in terms of postoperative wrist motion, pain scores, or grip strength. Interestingly, the non-PRP group exhibited better postoperative Quick DASH scores compared with the PRP group, although the preoperative Quick DASH scores were higher in the non-PRP group. These findings suggest that PRP injections may not provide additional benefits over arthroscopic repair alone in the treatment of peripheral TFCC tears.

Our findings are consistent with several previous studies that have reported no significant differences in pain scores and wrist motion parameters between PRP and non-PRP groups in the treatment of TFCC injuries or other wrist pathologies.[11,12] However, our results contrast with some studies that have demonstrated the superiority of PRP over non-PRP treatments in terms of pain reduction, functional improvement, or healing rates.[13,14] These discrepancies may be attributed to differences in study design, PRP preparation and application protocols, patient characteristics, or outcome measures used.

Despite the lack of significant differences between the groups in our study, PRP may still contribute to accelerated healing of TFCC injuries through its antifibrotic, proangiogenic, and promyogenic effects. PRP has been shown to inhibit transforming growth factor-beta 1, a key mediator of fibrosis, leading to reduced collagen deposition and scar formation.[15] Additionally, PRP contains various growth factors, such as vascular endothelial growth factor and platelet-derived growth factor, which promote angiogenesis and improve vascularization of the injured tissue.[16] Animal studies have demonstrated the promyogenic effects of PRP, with increased nucleated myofibers and large-diameter fibers suggestive of enhanced myofiber regeneration.[17,18] Although the TFCC is primarily composed of fibrocartilage, muscle-derived stem cells have been shown to contribute to cartilage regeneration.[19] We hypothesize that the synergistic effects of PRP's antifibrotic, proangiogenic, and promyogenic properties may create a favorable environment for TFCC healing, potentially accelerating the healing process and improving patient outcomes. However, further research is needed to elucidate the specific pathophysiological effects of PRP on TFCC injuries.

Our study has several limitations that should be considered when interpreting the results. The retrospective design may have introduced selection bias, as patients were not randomly assigned to the PRP and non-PRP groups, leading to potential differences in baseline characteristics that could have influenced the outcomes. The relatively small sample size has limited our ability to detect significant differences between the groups or assess the long-term effects of PRP on TFCC healing.

Another limitation of our study is the relatively short follow-up period, with an average of 3.94 ± 1.66 months. As collagen maturation takes approximately 6 months to reach the 90%+ level, this follow-up duration may not be sufficient to accurately assess the quality and capacity of the reconstructive construct. The short-term nature of our study limits our ability to draw conclusions about the long-term effects of PRP on TFCC healing and patient outcomes. Future studies with longer follow-up periods are needed to evaluate the efficacy of PRP in promoting collagen maturation and enhancing the long-term stability and functionality of the repaired TFCC. Furthermore, the lack of standardization in PRP preparation and application protocols may have contributed to variability in the results. Due to the retrospective nature of our study and the limitations in the available medical records, we were unable to reliably classify the TFCC injuries according to the Palmer classification as degenerative or traumatic.

Despite these limitations, our study highlights the need for larger, well-designed randomized controlled trials to clarify the role of PRP in the treatment of TFCC injuries and establish evidence-based guidelines for its use. Future multicenter prospective randomized controlled trials with larger sample sizes, balanced baseline characteristics, and longer follow-up periods are necessary to validate these findings and better assess the role of PRP in enhancing recovery from TFCC injuries. Additionally, standardized PRP preparation and application protocols should be developed to minimize variability in treatment and facilitate comparisons between studies. Importantly, a comprehensive cost-benefit analysis should be performed to evaluate the economic implications of incorporating PRP as an adjunct treatment in TFCC repair. This analysis would provide valuable insights into the financial feasibility and potential healthcare cost savings or expenditures associated with PRP use, helping to inform clinical decision-making and healthcare policy. In addition, future studies on this topic would benefit from including high-quality arthroscopic images or videos documenting the TFCC injury and repair process. Such visual documentation could provide valuable insights into the nature of the injuries treated, the specific techniques used during arthroscopic repair, and the potential effects of PRP application.

## CONCLUSIONS

In conclusion, this retrospective study investigated the effectiveness of PRP as an adjunct to arthroscopic repair of peripheral TFCC tears. Our results showed that patients receiving PRP did not demonstrate superior outcomes compared with those who did not, with the non-PRP group having better postoperative Quick DASH scores and no significant difference in pain scores between the groups. These findings suggest that the efficacy of PRP in this setting remains unclear.

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## DISCLOSURE

*The authors have no financial interest to declare in relation to the content of this article.*

## PATIENT CONSENT

*Informed consent was obtained from all patients.*

## ETHICAL APPROVAL

*This retrospective study was approved by the IRB of the Ethical Committee of the International Wrist Center (Study 2022-25, IRB approval number: A015002).*

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